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LACIS-T - A humid wind tunnel for investigating the Interactions between Cloud Microphysics and Turbulence

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To improve the fundamental and quantitative understanding of the interactions between cloud microphysical and turbulent processes, the Leibniz Institute for Tropospheric Research (TROPOS) has built up a new humid wind tunnel (LACIS-T). LACIS-T allows for the investigation of cloud microphysical processes, such as cloud droplet activation and freezing, under well defined thermodynamic and turbulent flow conditions. It therewith allows for the straight forward continuation, extension, and completion of the cloud microphysics related investigations carried out at the Leipzig Aerosol Cloud Interaction Simulator (LACIS) under laminar flow conditions.

Characterization of the wind tunnel with respect to flow, thermodynamics, and droplet microphysics is carried out with probes mounted inside (pitot tube and hot-wire anemometer for mean velocity and fluctuations, Pt100 sensor for mean temperature, cold-wire sensor for temperature fluctuations is in progress, as well as a dew-point mirror for mean water vapor concentration, a Lyman-alpha sensor for water vapor fluctuations is in progress) the measurement section, and from outside with optical detection methods (a laser light sheet is available for cloud droplet visualization, a digital holography system for detection of cloud droplet size distributions will be installed for tests in February 2017), respectively. Computational fluid dynamics (CFD) simulations have been carried out for defining suitable experimental conditions and assisting the interpretation of the experimental data.

In this work, LACIS-T, its fundamental operating principle, and first preliminary results from ongoing characterization efforts will be presented.